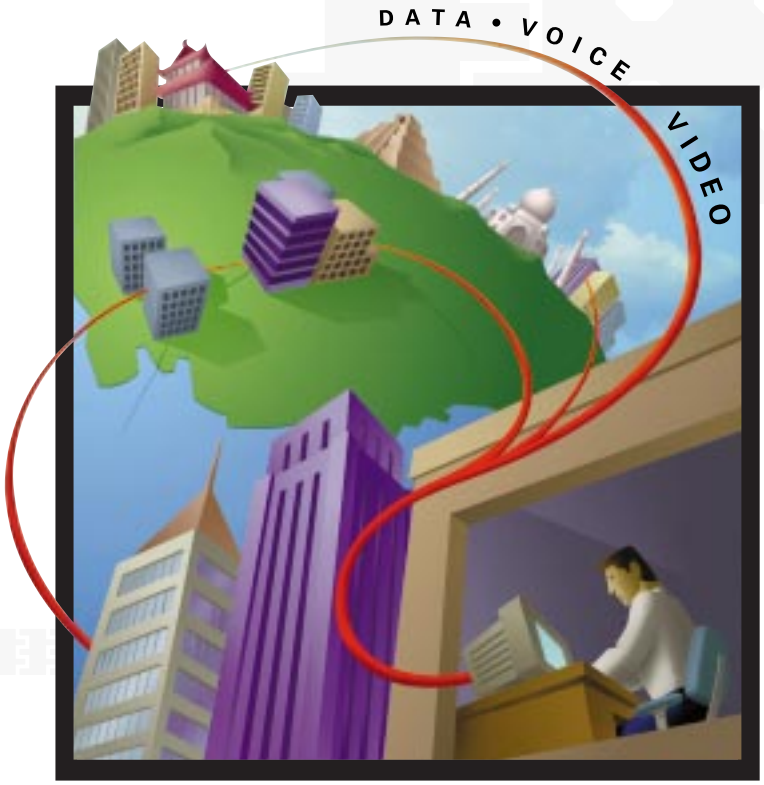
IGX Enterprise Brochure



Cisco IGX 8400 Series Wide-Area Switches

The Foundation of Next-Generation Wide-Area Networks

Cisco Systems

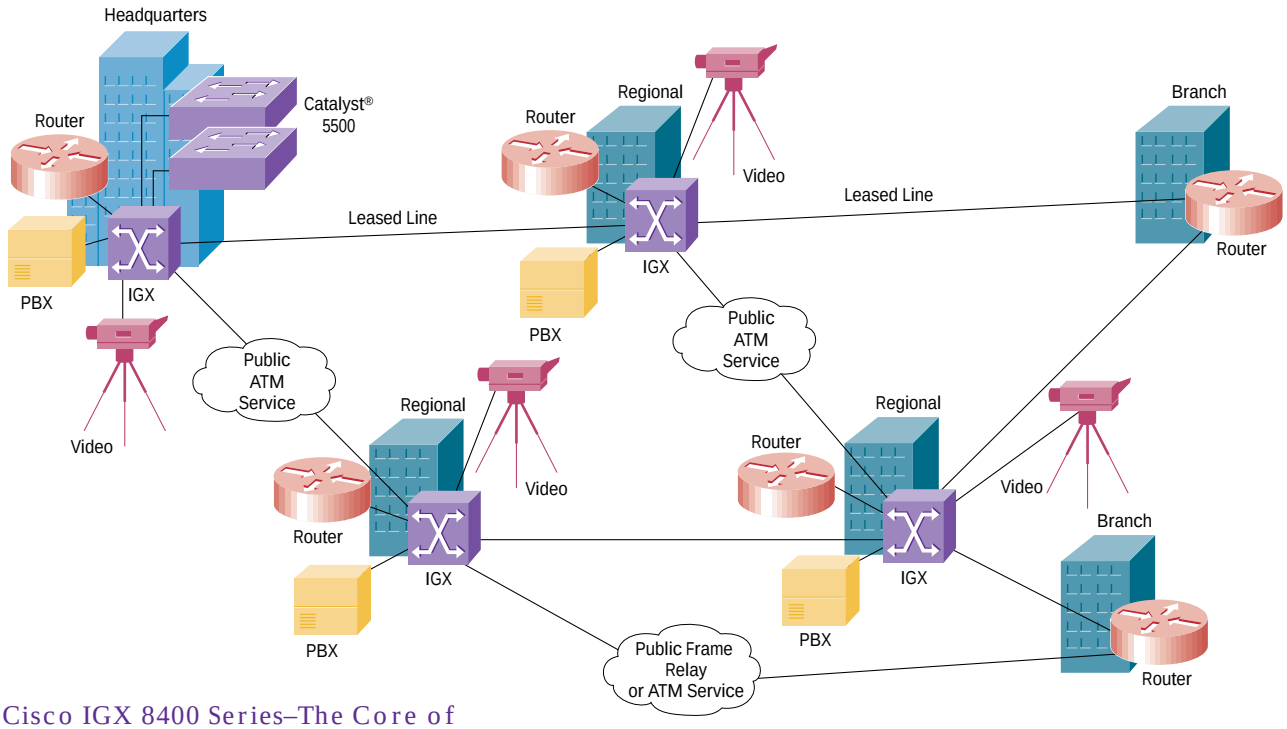
Cisco Systems

Stepping Up to the Next Generation of **Enterprise Wide-Area Networks**

If you're an enterprise IT professional, you know the challenge of delivering high-quality voice, data, and multimedia services throughout the enterprise while keeping costs under control. Today's next-generation WAN solutions from Cisco Systems connect all of your enterprise locations to cost-effectively support business-critical applications.

The Cisco IGX™ 8400 series wide-area switches provide the backbone required to deliver today's enterprise data, voice, fax, and video applications. Available as the IGX 8410 with eight slots, the IGX 8420 with 16 slots, or the IGX 8430 with 32 slots, the IGX 8400 series offers the greatest flexibility to meet a wide range of enterprise needs. The IGX 8400 series switches fully integrate with other Cisco WAN switching, access, and customer premises equipment (CPE) products to offer an end-to-end networking solution that maximizes operational efficiencies and reduces cost.

As the pioneer of the Internet and IP network infrastructures, and a leader in ATM, Frame Relay, traffic management, and quality of service (QoS), Cisco is uniquely qualified to build intelligent multiservice networks that give enterprises the flexibility to adapt to changing business and application requirements.



Cisco IGX 8400 Series–The Core of the Enterprise WAN

Efficient bandwidth utilization, intelligent QoS management features, and carrier-class reliability make the IGX 8400 series switch the ideal choice for meeting unique enterprise needs. With the IGX switch at the core of your WAN, you can consolidate multiple networks and add functionality while simplifying management and reducing costs. The answer to high, recurring WAN bandwidth costs, the IGX 8400 series delivers the highest bandwidth efficiency in the industry. Intelligent QoS and bandwidth management features ensure that all of your company's applications receive the quality of service they require. IGX features also enable you to extend traffic management and automatic configuration intelligence to your router equipment—saving time and increasing performance. Connect to public services as well, reduce leased-line costs, and maximize the cost-effectiveness of your WAN links.

The IGX switches form the enterprise network backbone, connecting headquarters with edge devices used to concentrate traffic from branch sites and mobile users. Tight integration with Cisco router and access products allows you to deliver multiservice capabilities across your network, automatically configure router parameters for traffic shaping, and greatly simplify network management.

Consolidate Networks over a Single Robust, Multiservice Backbone

One of the best ways to reduce bandwidth, management, and support costs is to consolidate data, voice, fax, and video traffic onto a single network. The IGX 8400 series enables you to do just that.

With interfaces for transporting ATM, Frame Relay, synchronous and asynchronous legacy data, time-division multiplexing (TDM), Internet, video, and voice traffic, the IGX 8400 switch consolidates multiple traffic types over a single reliable backbone. Advanced traffic management features ensure that each application automatically receives the bandwidth and QoS it requires.

The eight-slot IGX 8410 with ATM, Frame Relay, and voice service modules.

Guarantee Performance and Quality of Service with an Intelligent QoS Management Feature Suite

Successful networked applications earn high levels of end-user satisfaction. With IGX 8400 series switches, you can ensure high performance and guarantee QoS for every enterprise application. Intelligent QoS Management features are built in, delivering unmatched bandwidth efficiency, high performance for all users, and guaranteed quality of service for all traffic types across the backbone. The IGX 8400 switch cost-effectively increases application performance. In many cases, enterprises can reduce the number of T1/E1 lines required for distributing applications while increasing the variety and quality of the services they deliver. Intelligent QoS Management features of the IGX 8400 solution include:

Automatic Routing Management

Cisco WAN switches use a connection-oriented mechanism to provide connectivity across the network. The switches perform a Connection Admission Control (CAC) function on all types of connections in the network. Distributed network intelligence enables the CAC function to automatically route and reroute connections over optimal paths while guaranteeing the required QoS.

Dynamic Buffer Management

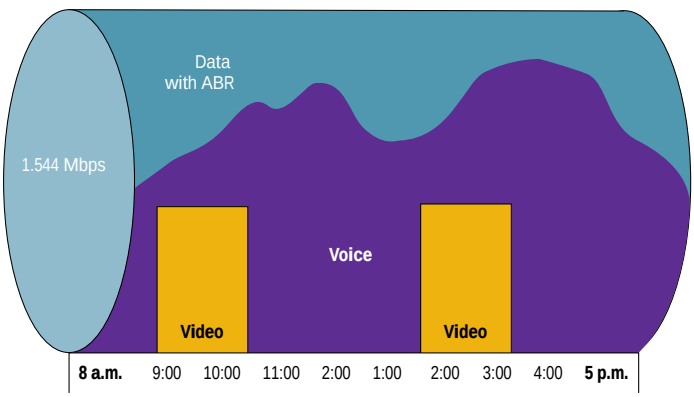
Cisco Frame Relay and ATM service modules are equipped with large buffers and a patented dynamic buffer management scheme for allocating buffers on a per-virtual circuit (per-VC) basis. The IGX 8400 switch dynamically assigns buffers to individual virtual circuits based on the amount of traffic and service-level agreements. This deep pool of available buffers readily accommodates large traffic bursts into the node. The IGX 8400 ATM modules provide 128,000 cells of buffering, while the Frame Relay modules provide 100,000 frame buffers.

Advanced Class-of-Service Management

Class-of-service management is essential for delivering the required QoS to all applications. Cisco switches contain per-VC queuing, per-VC rate scheduling, multiple classes of service queuing, and egress queuing. This selection enables network managers to refine connections to meet specific application needs. Cell admission rates automatically adjust depending on whether and where congestion exists on the network (as communicated by the traffic management mechanism).

Optimized Bandwidth Management

The IGX 8400 switch ensures fair and cost-efficient bandwidth utilization using various techniques. Voice compression and Voice Activity Detection (VAD) are used for voice. Repetitive Pattern Suppression (RPS) is used for circuit data traffic. ABR and ForeSight licensed technology are used for ATM and Frame Relay traffic management. ABR is a standards-based ATM traffic management mechanism, and the ForeSight technology is Cisco's leading-edge implementation that mirrors ABR capabilities for Frame Relay traffic. ABR and the ForeSight feature set optimize real-time traffic performance and throughput, as well as minimize data loss.



Optimized Bandwidth Management ensures efficient use of available network capacity. ABR mechanisms dynamically allow more data into the network if other traffic is not present.

Scale Your WAN as Business Applications and Needs Change

Business growth and new applications demand networking flexibility. The Cisco IGX 8400 series provides unmatched scalability, allowing you to cost-effectively increase capacity, support a wide range of traffic types, and support emerging voice, video, and Internet applications.

The IGX 8400 series is available with 8, 16, or 32 slots (IGX 8410, IGX 8420, or IGX 8430, respectively) and uses a 1.2-Gbps redundant cell bus to switch cells between optionally redundant user and trunk interface modules. With the IGX switch, bandwidth is dynamically assigned to any slot. Traffic destined to another node is received by the appropriate trunk interface module and sent to the appropriate trunk port. Service interface modules offer the following port densities:

- Two or four OC-3/STM-1 ATM interfaces per module
- Three or six T3/E3 ATM interfaces per module
- Four or eight T1/E1 ATM interfaces per module
- Four or eight T1/E1 Frame Relay interfaces per module (channelized or unchannelized)
- Four or twelve V.35 or X.21 Frame Relay interfaces per module
- Four HSSI Frame Relay interfaces per module
- Four EIA/TIA-449 or V.35 or X.21 circuit data interfaces per module
- Four or eight EIA/TIA-232 circuit data interfaces per module
- One- or two-port voice module (T1/E1/J1)

The IGX 8400 series provides a variety of interface densities to scale with the needs of your locations. The IGX 8400 series can scale from one port up to 360 ports.

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A Reliable Platform Delivers the Highest Application Availability and End User Satisfaction

Unforeseen downtime for a mission-critical application can result in millions of dollars in losses. Originally designed for service providers, the IGX 8400 series switch offers carrier-class reliability, ensuring that your vital business applications are always available to the people who need them. A midplane design features front cards that perform processing and switching functions and back cards that perform adaptation and provide interfaces for physical connectivity. System maintenance can be performed at the front cards without disconnecting interface cables. Even during maintenance and upgrades, your applications remain available, and users remain productive.

Redundant Critical Components

Redundancy ensures nonstop operation, and all IGX common equipment can be configured redundantly for maximum platform reliability. AC-powered IGX 8400 units can be equipped with dual AC power feeds and equipped with power supplies configured in a load-sharing, redundant mode. Processor cards can be configured for hot-standby redundancy. All user and trunk interface modules can be configured redundantly to achieve the required level of reliability, and all cards are hot-swappable. New software releases can be remotely downloaded onto the redundant processor for background installation while traffic continues. In the unlikely event of a problem during switchover, the IGX 8400 switch will automatically revert to the previous software version.

Flexible Routing Paths

The IGX 8400 series also features an advanced distributed intelligence algorithm that enables the network to automatically route new connections and, if necessary, react to failures in network facilities. You can specify preferred paths or avoid certain paths across the network when configuring new connections. Each connection is routed or rerouted to ensure that it receives its required minimum bandwidth and configured QoS. Rerouting priorities can also be established for every connection.

The IGX 8420 series switch has 16 slots.

The Cisco IGX 8400 Series Has What It Takes-No Matter What Your Business Needs

Whether you need to consolidate multiple networks, integrate legacy data traffic, accommodate emerging voice and Internet applications, or improve application performance, the Cisco IGX 8400 series can meet your needs.

ATM Services

The IGX 8400 series offers standards-compliant ATM User-to-Network Interface/Network-to-Network Interface (UNI/NNI) on a variety of physical interface types.

All ATM interfaces support per-VC queuing, rate scheduling, and up to 16 classes of service, including those defined by the ATM Forum:

- Constant Bit Rate (CBR)
- Variable Bit Rate (Real-Time) (VBR [RT])
- Variable Bit Rate (Nonreal-Time) (VBR [NRT])
- Available Bit Rate (ABR)
- Unspecified Bit Rate (UBR)

The IGX 8400 series also offers ATM interfaces that can be customized to meet the performance requirements of specific applications. All ABR implementations are supported, including Virtual Source/Virtual Destination (VS/VD), Explicit Forward Congestion Indication (EFCI) marking, and Explicit Rate (ER) marking.

Frame Relay Services

Frame Relay services are today's fastest-growing network services for business-critical applications. The IGX 8400 series switch offers standards-compliant Frame Relay UNI/NNI on a variety of physical interface types. Cisco's implementation of Frame Relay goes beyond standard requirements. Intelligent QoS Management features enable built-in congestion avoidance mechanisms to deliver unbeatable performance for Frame Relay traffic. Enhanced messaging on the UNI enables the IGX 8400 switch to extend ForeSight traffic management to Cisco routers, delivering high QoS across the entire Frame Relay network. An Enhanced Local Management Interface (ELMI) also enables automatic Frame Relay traffic shaping parameter configuration on Cisco routers, saving time, reducing the potential for configuration errors, and eliminating long troubleshooting times.

Tag Switching

Cisco's Tag Switching technology provides you with a highly scalable, reliable means of integrating IP traffic with ATM traffic. Compliant with the emerging IETF standard for Multiprotocol Label Swapping (MPLS), Tag Switching delivers end-to-end QoS support for IP and ATM traffic while increasing scalability.

Voice Services

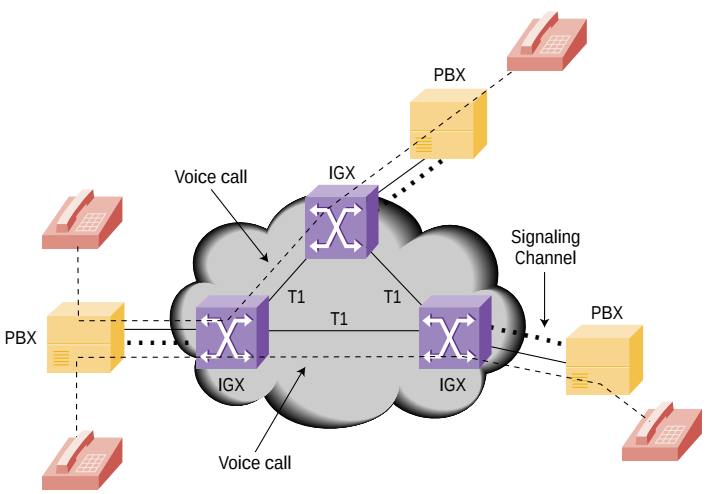
As pressure increases to reduce costs, many enterprises are consolidating voice traffic over WANs to reduce networking costs and capitalize on WAN bandwidth. The IGX 8400 switch offers efficient, high-quality voice connectivity across the wide-area backbone. Voice capabilities can be extended into branch offices using Cisco access products—compact, economical integrated service access devices that combine voice, video, and data traffic for transport over public or private ATM, Frame Relay, or leased-line networks. All IGX voice interfaces can be directly attached to a PBX for voice or fax/data connectivity via a T1/E1 interface.

Leading-Edge Voice Compression

The IGX voice interfaces support standards-based voice compression schemes and onboard echo cancellation. Voice compression reduces the amount of bandwidth required for voice connections across the wide-area network. The IGX 8400 series supports the following voice compression techniques:

- Adaptive Differential Pulse Code Modulation (ADPCM); 32 kbps, 24 kbps, 16 kbps
- Low-Delay, Code-Excited Linear Prediction (LD-CELP); 16 kbps
- Conjugate-Structured, Algebraic Code-Excited Linear Prediction (CS-ACELP); 8 kbps

The IGX 8400 switch offers efficient, high-quality voice connectivity across the wide-area backbone.



Silence Suppression

The voice interfaces also support VAD silence suppression, which distinguishes between silence and speech on voice connections. With VAD, cells are sent on the trunk only when there is something to send. With most voice connections consisting of up to 60 percent silence, VAD technology enables the IGX 8400 series to achieve an average 2:1 compression ratio, thus saving additional bandwidth. When combined with ADPCM, LD-CELP, or CS-ACELP compression schemes, VAD enables you to achieve compression ratios beyond 8:1.

Fax/Modem Support

In addition, the voice interfaces support fax and modem data transport. Fax calls originated via a PBX can be detected by sampling the 2100-Hz tone. For Group 3 fax, the Universal Voice Module (UVM) supports Fax Relay whereby it demodulates and remodulates the signal and transports a fax across the network using only 9.6 kbps of network capacity. This dramatically reduces the amount of bandwidth utilized across the network. The Channelized Voice Module allows for fax/data transport across the network as 64 kbps or 32 kbps.

Voice Switching Support

The IGX 8400 series also supports voice switching capabilities using the Voice Network Switching (VNS) system. VNS enables an IGX network to function as a tandem PBX that receives signaling from all attached PBXs, interprets it, and dynamically establishes voice connections between source and destination PBXs. The network routes each voice channel on a per-call basis and extends advanced PBX features (such as transfer, caller ID, and camp-on) across the wide-area network. With VNS, bandwidth-hungry data applications can dynamically use available trunk capacity, thus maximizing the efficiency of available network resources. The network ensures an optimal connection for each call, reducing delay and improving voice quality by minimizing compression cycles. With VNS, IGX switches can reduce the number of ports required on the PBX.

Circuit Data Services

Circuit data capabilities enable synchronous or asynchronous legacy data or video to be transported across the WAN through a fixed-delay, fixed-throughput, zero discard, point-to-point data connection. Available speeds range from 1.2 kbps to T1/E1 using standard interfaces such as V.28/RS-232, V.11/X.21 or V.35, EIA/TIA-449, and T1/E1. These services can also be used to migrate aging TDM networks to a new, multiservice backbone.

Data Compression

Unique to the IGX 8400 series is the capability to dynamically compress data connections (up to 128 kbps) by using RPS. With RPS, one end of a data connection determines the repetitive pattern and the number of pattern occurrences and does not assemble them into cells for network transport. The far end of the data connection determines the repetitive pattern and pattern occurrences by monitoring the incoming cells and their sequence numbers and regenerates these patterns to the user interface. This capability is effective when implementing SDLC/HDLC connections across the network, because idle conditions (flags 7E) can be suppressed and not transported.

Flexible Clocking, Lead Monitoring, and Control

IGX circuit emulation interfaces offer flexible clocking to accommodate the connection of colocated or remote devices to an IGX 8400 series network. These interfaces also monitor control leads on each interface, using changes to "condition" the leads at the far end of the connection. The IGX switch can also be configured to use a change in lead status on a circuit data interface to trigger an action in the network. This feature can be used to dynamically set up bandwidth-on-demand connections across the wide-area network.

Networking Connectivity

A network of IGX 8400 series switches can be deployed with a variety of trunk interfaces and speeds ranging from 64 kbps to 155 Mbps. Network trunks can be implemented using dedicated leased-line facilities or via public ATM services.

Comprehensive Cisco Network Management Solutions

Cisco leverages the network itself to provide reliable, robust, and scalable network management capabilities. With network intelligence built into the IGX 8400 series, many network management functions, including routing, rerouting, monitoring, auto-discovery, and reporting are performed automatically.

For ease of operation and integration, use the CiscoView, Cisco-wide common GUI device management tool for element-level configuration and monitoring. For network-wide topology, event, configuration, data collection, performance, and security management, the Cisco StrataView Plus® software is available, with integration into either NetView or HP OpenView. StrataView Plus software also provides interfaces to service management applications, such as automated provisioning via Simple Network Management Protocol (SNMP) application programming interfaces (APIs) and an SQL-based API for database queries. Cisco also offers an integrated product suite that includes Info Center and Service Activation Center to manage partitioned network events and diagnostics, scheduled provisioning, logical grouping of network resources, and customer management reporting services.

Cisco network management products provide a standards-based, easy-to-use multiservice network management solution and are key components of Cisco's end-to-end WAN solutions.

Cisco IGX 8400 Series Service and Support

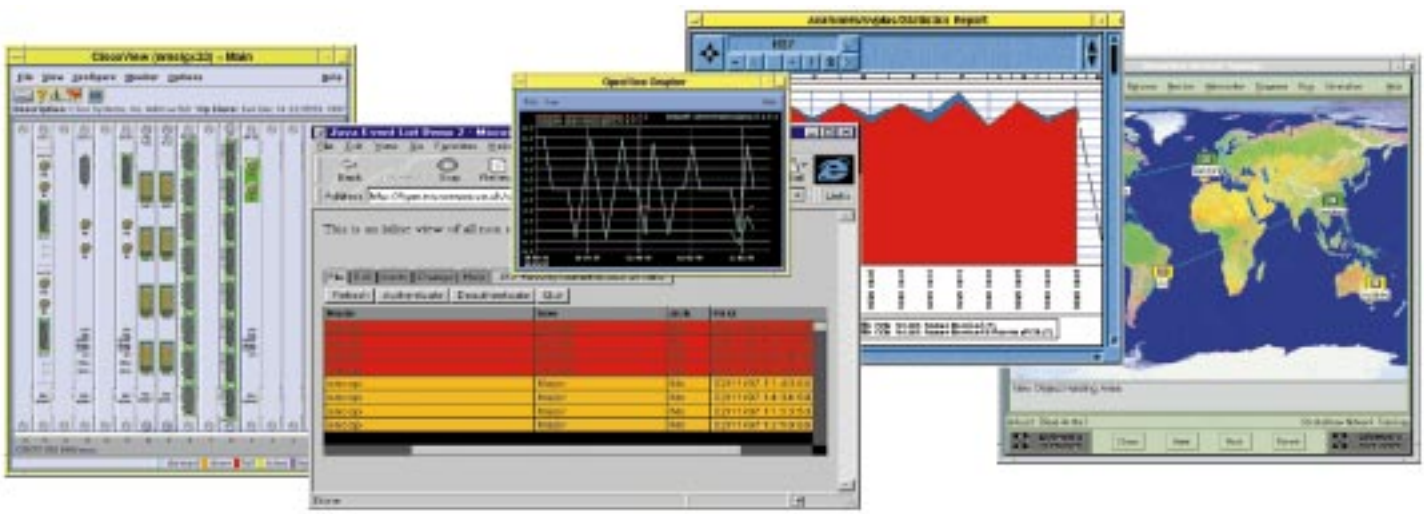
When your organization relies on its network to improve bottom-line results, you need every available advantage to rise to the challenge. Cisco enterprise support solutions provide you with a suite of flexible support and service options that can maximize staff productivity while ensuring optimal network uptime, performance, and lifespan.

With Cisco enterprise support solutions, you can be sure that your investment will meet and exceed your expectations. Network Implementation Services (NIS) are designed to help you implement large-scale, complex networks across multiple sites, as smoothly and effectively as possible. Cisco's SMARTnet™ support provides you with software maintenance, registered access to Cisco Connection Online (CCO), advance hardware replacement, and technical support resources required for self maintenance. For special networking projects or dedicated, ongoing support, turn to Cisco's advanced and customized services. Cisco professional services and its Network Supported Account program provide focused service and support resources to help you maximize networking effectiveness.

For More Information

For more information about the Cisco IGX 8400 series of switches, contact your Cisco sales representative. Or visit Cisco's Web site at www.cisco.com.

Cisco's End-to-End Management Tools



Cisco IGX 8400 Series **Switch Specifications**

Common Modules

Network Processor Module (NPM)

- Contains system software and controls the switch
- Provides distributed intelligence via communication with other network nodes
- Provides interface-to-network management

Interface Modules

Universal ATM Switch Module (UXM)

- Four OC-3/STM-1 (MMF) ports per module
- Two or four OC-3/STM-1 (SMF) ports per module
- Three or six T3/E3 ports per module
- Four or eight T1/E1 ports per module with inverse multiplexing over ATM (IMA) functionality
- 128,000 cells of buffering per module
- Per-VC queuing and dynamic buffer management

Universal Frame Relay Module—Model C (UFM-C)

- Four or eight T1/E1 ports per module (channelized or unchannelized)
- Frame Relay-to-ATM service interworking
- Per-VC queuing and dynamic buffer management
- Traffic management to Cisco routers
- Enhanced Local Management Interface (ELMI) to Cisco routers

Universal Frame Relay Module—Model U (UFM-U)

- Up to 12 V.35 or X.21 ports per module
- Up to four HSSI ports per module
- Frame Relay-to-ATM service interworking
- Per-VC queuing and dynamic buffer management
- Traffic management to Cisco routers
- ELMI to Cisco routers

Frame Relay Modules (FRM)

- Up to four V.35 or X.21 ports per module
- One T1/E1 port per module (channelized or unchannelized)
- Per-VC queuing and dynamic buffer management
- Traffic management to Cisco routers

Universal Voice Module (UVM)

- Two T1/E1/J1 ports per module
- 32-kbps, 24-kbps, 16-kbps ADPCM compression based on G.721, G.723, G.726 standards
- 16-kbps LD-CELP compression based on G.728 standard
- 8-kbps CS-ACELP compression based on G.729 and G.729A standards
- D-channel compression
- VAD
- Onboard echo cancellation
- Fax Relay and modem detection

Channelized Voice Module (CVM)

- One T1/E1/J1 port per module
- Standards-based 32-kbps, 24-kbps, 16-kbps ADPCM compression
- VAD
- Onboard echo cancellation
- Fax Relay and modem detection

Low-Speed Data Module (LDM)

- Four or eight EIA/TIA-232 ports per module
- Support for synchronous or asynchronous data
- 1.2 kbps to 19.2 kbps per port (can support lower-speed async via oversampling)
- Repetitive pattern suppression

Dynami

High-Speed Data Module (HDM)

- Four EIA/TIA-232, V.35, X.21, EIA/TIA-449 ports per module
- Supports synchronous data
- 1.2 kbps to 1.344 Mbps per port
- Repetitive pattern suppression up to 128 kbps

Channelized Voice Module—DS0A (CVM-DS0A)

- One channelized T1/E1 port per module
- Support for DS0A functionality for subrate data connections

Channelized Voice Module—TT (CVM-TT) Model C

- One channelized T1/E1 port per module
- Support for T1/E1 circuit emulation

Networking Connectivity

Universal ATM Switch Module (UXM)

- Four OC-3/STM-1 (MMF) ports per module
- Two or four OC-3/STM-1 (SMF) ports per module
- Three or six T3/E3 ports per module
- Four or eight T1/E1 ports per module with inverse multiplexing over ATM (IMA) functionality
- Up to 16 classes-of-service queues per trunk interface
- 128,000 cells of buffering per module with dynamic buffer management

ATM Line Module/Model B (ALM/B)

- One T3/E3 port per module
- 45 Mbps of throughput per module
- Up to six classes-of-service queues per trunk interface
- 32,000 cells of buffering per module with dynamic buffer management

Broadband Trunk Module (BTM)

- One E1 port per module
- One E2 port per module
- One HSSI port per module
- 16 Mbps of throughput per module
- Up to six classes-of-service queues per trunk interface

Network Trunk Module (NTM)

- One T1/E1/Y1 port per module
- One serial port per module (V.35, X.21)
- 64 kbps to 2.048 Mbps trunk speed
- 2 Mbps of throughput per module
- Up to six classes-of-service queues per trunk interface

VNS System Specifications

The VNS system is fully hardware redundant, providing a fully fault-tolerant, high-availability system. VNS hardware includes:

- 170 MIPS CPU
- 128 MB of RAM
- 2 GB hard disk
- Heavy-duty power supply
- AC or DC power

Supported Protocols

- QSIG
- QSIG Generic Functional procedures
- DPNSS
- CAS (North America)
- Q.931A
- 4ESS
- DSS1—EuroISDN

PBX Compatibility

- Alcatel
- Bosch Telecom
- Ericsson
- GPT
- Lucent
- NEC
- Nortel
- OKI
- Philips
- Siemens
- Tadiran

Stepping Up to the Next Generation of **Enterprise Wide-Area Networks**

	Mechanical Configuration	Dimensions	Power Requirements
IGX 8410	• Eight-slot unit, rack-mount or freestanding • 1.2-Gbps cell-switching bus • CISPR B EMI-certified	24.4 inches (61.9 cm) high 19.9 inches (50.5 cm) wide 27.1 inches (68.8 cm) deep	• Distributed -48V DC power conversion on modules • Universal AC input option (90 - 264V) with AC-DC converter • 220/240 VAC AC-DC converter, 1:n redundant • 48V DC input option with redundancy • Full redundancy available for all power options • Dual power inputs available for all AC power options • Hot-swappable 400W AC power supplies (for IGX 8410 only); 875W AC power supplies (for IGX 8420 and IGX 8430) • Power supply unit indicators and monitoring
IGX 8420	• 16-slot unit, rack-mount or freestanding • 1.2-Gbps cell-switching bus • CISPR B EMI-certified	32 inches (81.3 cm) high, 32.6 inches (82.8 cm) high (with feet) 19.9 inches (50.5 cm) wide 27.1 inches (68.8 cm) deep	
IGX 8430	• 32-slot unit, rack-mount or freestanding • 1.2-Gbps cell-switching bus • CISPR B EMI-certified	55 inches (139.7 cm) high 19.9 inches (50.5 cm) wide 27.1 inches (68.8 cm) deep	

Standards Compliance

	The IGX multiservice switch complies with all of the following standards.
ATM Forum	UNI V.3.0, 3.1, TM 4.0, NNI V.3.0, 3.1
Frame Relay Forum	FRF.1.1, 2.1, 3.1, 5, 6, 8
ITU	E.164, E190, G.164, G.165, G.703, G.705, G.711, G.721, G.723, G.726, G.728, G.729, G.729A, G.804, I.233.1, I.350, I.361, I.362, I.363, I.36X.1, I.370, I.371, I.372, I.432, I.555, Q.922, Q.933
ANSI	T1.101, T1.102, T1.102.1, T1.105, T1.107, T1.107A, T1.602, T1.606, T1.606a, T1.606b, T1.617, T1.617 Annex A, T1.618, T1.629, T1.630, T1.633, T1.635, T1.636, T1/E1.2/93-020RA
Voice Signaling	4ESS: TR41459, CAS Switching: EIA/TIA-464-A (T1), DPNSS: BTNR 188, DSS1: ETSI Euro-ISDN, ETS 300 102-1, ETSI QSIG: ETS 300-171, ETS 300-172, ETS 300-173, ETS 300-239, Japanese ISDN: Q.931A

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